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(54) **METHODS AND SYSTEMS FOR MANAGING DIRECTORY INFORMATION**

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H04L 29/08	(2006.01)
H04L 29/12	(2006.01)
G06F 15/16	(2006.01)

(52) **U.S. Cl.**

CPC ***H04L 63/10*** (2013.01); ***H04L 61/1523*** (2013.01); *H04L 67/02* (2013.01)

(58) **Field of Classification Search**

CPC H04L 9/32; H04L 63/10; H04L 61/1523; H04L 67/02; G06F 15/173; G06F 17/30067; G06F 21/41

USPC 709/223–229, 203; 713/200–201; 707/3, 707/759, 771, 999.003; 726/6, 5

See application file for complete search history.

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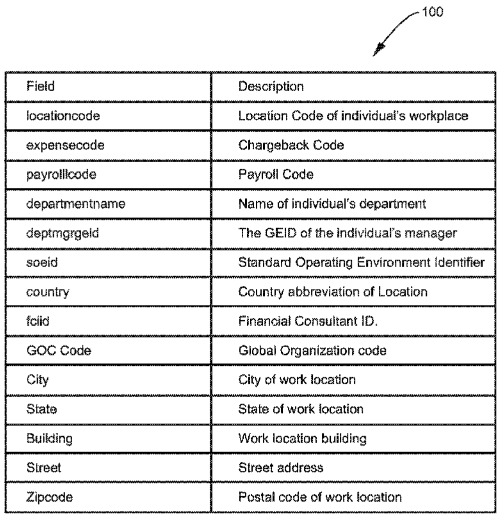
(57) **ABSTRACT**

Methods and systems for managing directory information, such as onboarding a LDAP server, employing a processor coupled to memory and other computer hardware and software components for receiving a request related to one or more applications from a requestor in pre-determined business logic, acknowledging the request by an approver function without requiring the requestor to negotiate, for example, with an LDAP administrator to justify the request, and provisioning the request into the enterprise LDAP server in the pre-determined business logic.

14 Claims, 4 Drawing Sheets



Field	Description
locationcode	Location Code of individual's workplace
expensecode	Chargeback Code
payrollcode	Payroll Code
departmentname	Name of individual's department
deptmgrgeid	The GEID of the individual's manager
soeid	Standard Operating Environment Identifier
country	Country abbreviation of Location
fciid	Financial Consultant ID.
GOC Code	Global Organization code
City	City of work location
State	State of work location
Building	Work location building
Street	Street address
Zipcode	Postal code of work location

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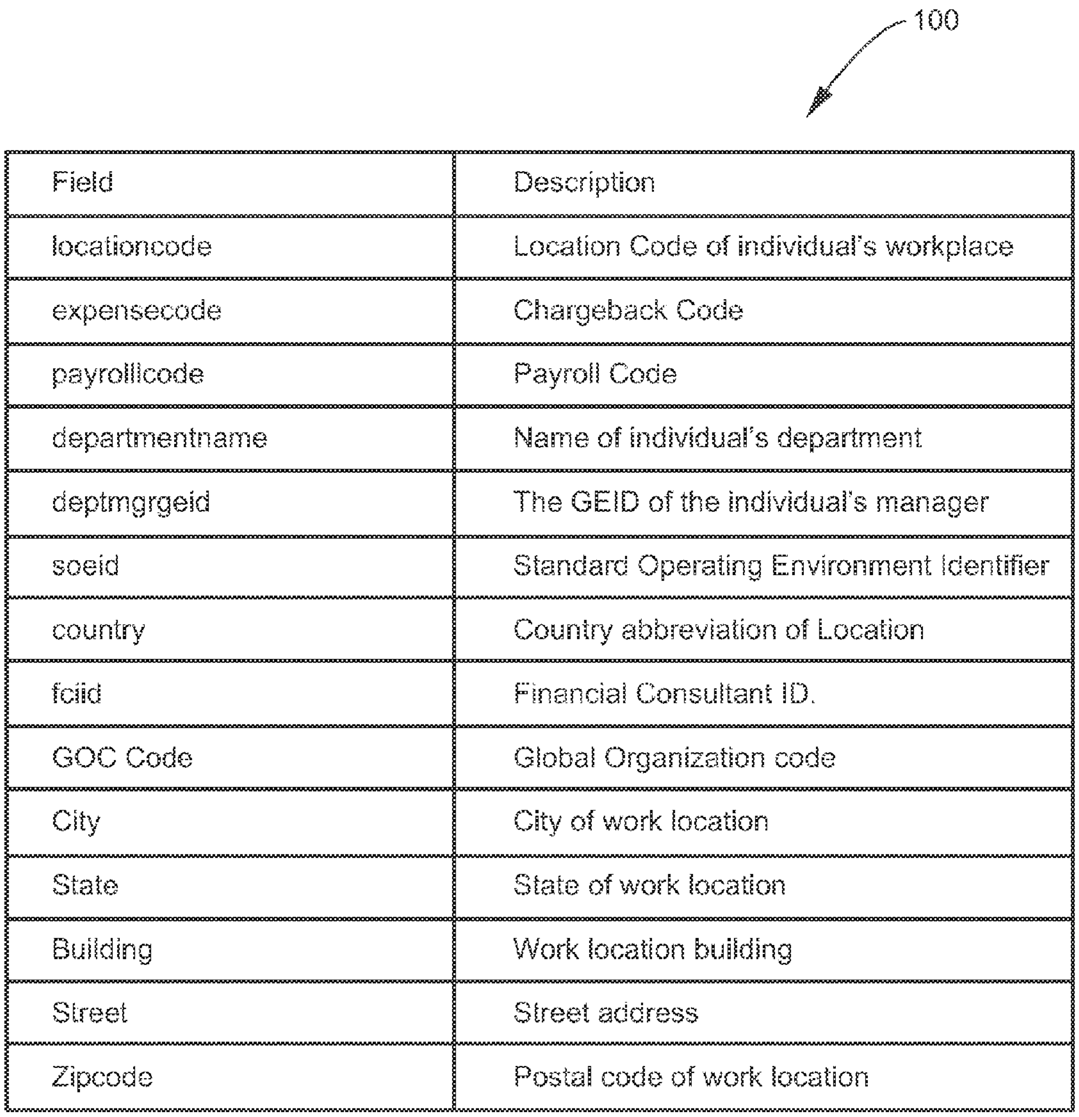

Field	Description
locationcode	Location Code of individual's workplace
expensecode	Chargeback Code
payrollcode	Payroll Code
departmentname	Name of individual's department
deptmgrgeid	The GEID of the individual's manager
soeid	Standard Operating Environment Identifier
country	Country abbreviation of Location
fciid	Financial Consultant ID.
GOC Code	Global Organization code
City	City of work location
State	State of work location
Building	Work location building
Street	Street address
Zipcode	Postal code of work location

Fig. 1

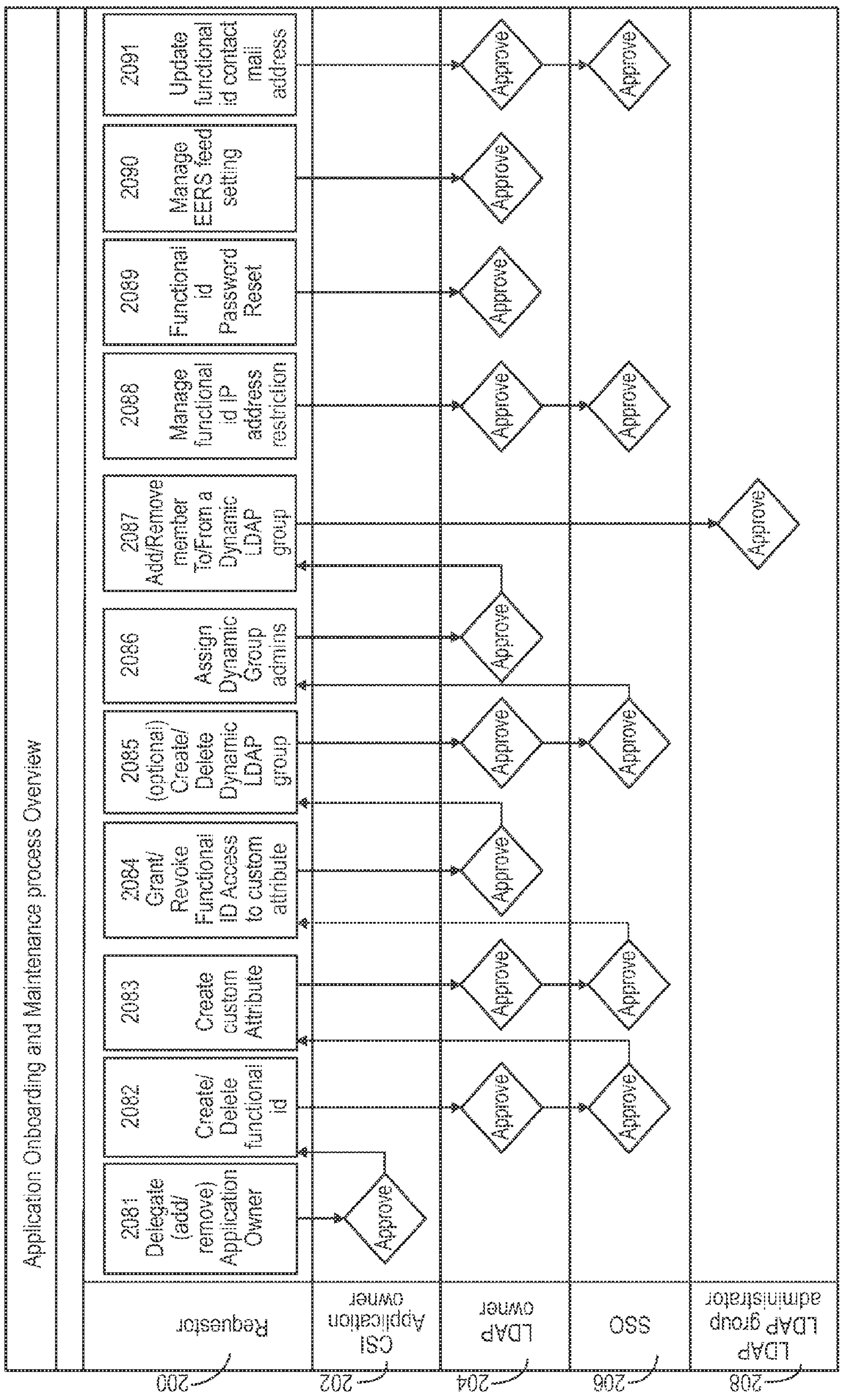
Application Onboarding and Maintenance process Overview
Requestor
CSI Application owner
LDAP owner
SSO
LDAP LDAP group administrator
200
202
204
206
208
2081 Delegate (add/ remove) Application Owner
2082 Create/ Delete functional id
2083 Create custom Attribute
2084 Grant/ Revoke Functional ID Access to custom attribute
2085 (optional) Create/ Delete Dynamic LDAP group
2086 Assign Dynamic Group admins
2087 Add/Remove member To/From a Dynamic LDAP group
2088 Manage functional id IP address restriction
2089 Functional id Password Reset
2090 Manage EERS feed setting
2091 Update functional id contact mail address
Approve

Fig. 2

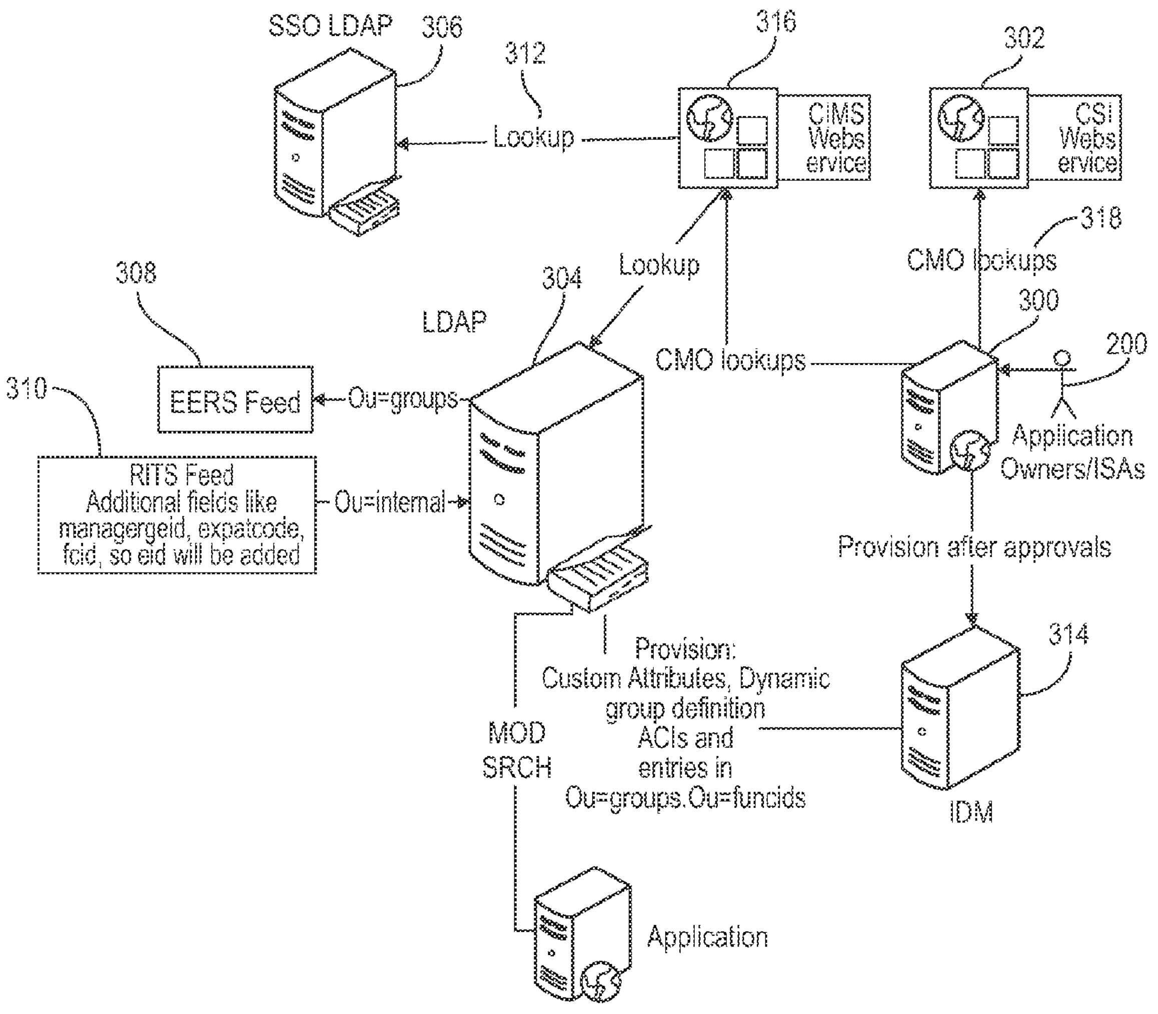
SSO LDAP
306
312
Lookup
316
CIMS Webs ervice
302
CSI Webs ervice
318
CMO lookups
308
304
LDAP
Lookup
300
CMO lookups
200
310
EERS Feed
Ou=groups
RITS Feed Additional fields like managergeid, expatcode, fcid, so eid will be added
Ou=internal
Application Owners/ISAs
Provision after approvals
314
Provision: Custom Attributes, Dynamic group definition ACIs and entries in Ou=groups.Ou=funcids
MOD SRCH
IDM
Application

Fig. 3

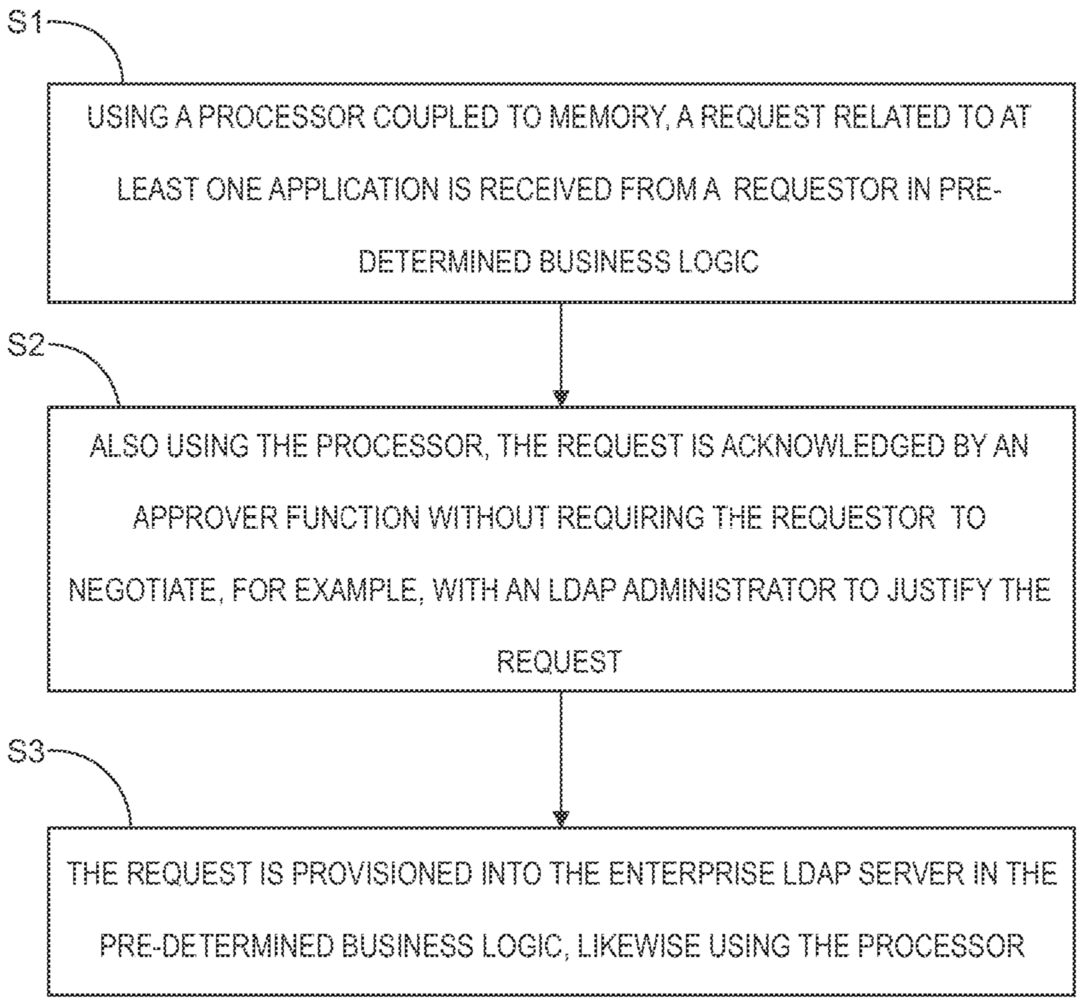
S1
USING A PROCESSOR COUPLED TO MEMORY, A REQUEST RELATED TO AT LEAST ONE APPLICATION IS RECEIVED FROM A REQUESTOR IN PRE-DETERMINED BUSINESS LOGIC
S2
ALSO USING THE PROCESSOR, THE REQUEST IS ACKNOWLEDGED BY AN APPROVER FUNCTION WITHOUT REQUIRING THE REQUESTOR TO NEGOTIATE, FOR EXAMPLE, WITH AN LDAP ADMINISTRATOR TO JUSTIFY THE REQUEST
S3
THE REQUEST IS PROVISIONED INTO THE ENTERPRISE LDAP SERVER IN THE PRE-DETERMINED BUSINESS LOGIC, LIKEWISE USING THE PROCESSOR

Fig. 4

METHODS AND SYSTEMS FOR MANAGING DIRECTORY INFORMATION

FIELD OF THE INVENTION

The present invention relates generally to the field of directory services, and more particularly to methods and systems for managing directory information.

BACKGROUND OF THE INVENTION

Traditionally, the function of extending an application directory schema, which typically involves adding and/or defining attributes, was exclusively an administrative function. Such administrative functions take a considerable amount of time to perform, and most application owners are not current app experts. Further, while the application owners know the business want these authorization attributes, they do not want to be concerned with how it is being done. Currently, the process requires a discussion or negotiation between an administrator and the application owner with a considerable amount of justification that is cumbersome and time-consuming and leads to costly delays.

There is a present need for methods and systems for managing directory information that address and overcome the problems of existing implementations and allow operational personnel to approve requests without lengthy negotiations with administrators.

SUMMARY OF THE INVENTION

Embodiments of the invention employ computer hardware and software, including, without limitation, one or more processors coupled to memory and non-transitory computer-readable storage media with one or more executable programs stored thereon which instruct the processors to perform the methods and systems for managing directory information described herein.

Embodiments of the invention provide methods and systems for managing directory information including, for example, onboarding an enterprise Lightweight Directory Access Protocol (LDAP) server that may involve receiving, using a processor coupled to memory, a request related to at least one application from a requestor in pre-determined business logic; acknowledging the request by an approver function likewise using the processor; and provisioning the request into the enterprise LDAP server in the pre-determined business logic also using the processor.

In aspects of embodiments of the invention, receiving the request may involve, for example, receiving the request to provision an attribute for authorization to access the at least one application. In other aspects, receiving the request may involve, for example, receiving the request from a user to provision the user's own attribute for authorization to access the at least one application. In further aspects, receiving the request to provision the attribute for authorization may involve, for example, receiving the request to provision an attribute defining a user within the attribute. In additional aspects, receiving the request to provision the attribute defining a user may involve, for example, receiving the request to provision a string type attribute defining the user within the attribute.

In other aspects of embodiments of the invention, receiving the request in pre-determined business logic may involve, for example, translating the request into LDAP logic. In additional aspects, receiving the request may involve, for example, receiving the request on form fields displayed by a web-based internal application of an enterprise. In further aspects, receiving the request may involve, for example, receiving the request for at least one of delegating or removing an application owner, creating or deleting a function identifier (ID), creating a custom attribute, granting or revoking functional ID access to a custom attribute, creating or deleting a dynamic LDAP group, assigning a dynamic group administrator, and adding or removing a member from a dynamic LDAP group. In additional aspects, receiving the request may involve, for example, receiving the request for at least one of managing functional ID Internet Protocol (IP) address restriction, functional ID password reset, manage enterprise entitlement review system (EERS) feed, and update functional ID contact mail address.

In further aspects of embodiments of the invention, acknowledging the request may involve, for example, acknowledging the request by at least one of an application owner, an enterprise LDAP owner, a single sign-on (SSO) owner, and an enterprise LDAP group administrator. In still further aspects, acknowledging the request may involve, for example, acknowledging all requests by the application owner. In other aspects, acknowledging the request may involve, for example, reviewing the request and acknowledging the request in a pre-determined automated sequence. In still other aspects, acknowledging the request in the pre-determined automated sequence may involve, for example, approving the request without requiring justification of a need for the request.

In additional aspects of embodiments of the invention, approving the request may involve, for example, sending the request to a queue for the approver function. In other aspects, provisioning the request may involve, for example, creating an application role as an attribute. In further aspects, provisioning the request may involve, for example, granting functional ID access for the application on an application role attribute. In still further aspects, provisioning the request may involve, for example, defining an application role attribute as a LDAP group. In still other aspects, provisioning the request may involve, for example, performing lookups using a LDAP logic translation of the pre-determined business logic.

These and other aspects of the invention will be set forth in part in the description which follows and in part will become more apparent to those skilled in the art upon examination of the following or may be learned from practice of the invention. It is intended that all such aspects are to be included within this description, are to be within the scope of the present invention, and are to be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a table that illustrates examples of attributes that are not presently available via existing single sign-on (SSO) Lightweight Directory Assistance Protocol (LDAP) services that are made available by embodiments of the invention;

FIG. **2** is a flow chart that illustrates an overview example of the process of onboarding and maintaining applications from an application owner's perspective for embodiments of the invention;

FIG. **3** is a schematic diagram which illustrates an overview example of components and the flow of information between components for embodiments of the invention; and

FIG. **4** is a flow chart that illustrates an example of the process of onboarding an enterprise LDAP server according to embodiments of the invention.

DETAILED DESCRIPTION

Reference will now be made in detail to embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings. Each example is provided by way of explanation of the invention, not as a limitation of the invention. It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope or spirit of the invention. For example, features illustrated or described as part of one embodiment can be used in another embodiment to yield a still further embodiment. Thus, it is intended that the present invention cover such modifications and variations that come within the scope of the invention.

Embodiments of the invention provide methods and systems for managing directory information that enables application owners, who are typically also the end users of an application, to provision their own attributes for authorization purposes. FIG. **1** is a table **100** that illustrates examples of attributes that are not presently available via existing single sign-on (SSO) Lightweight Directory Assistance Protocol (LDAP) services and which are made available by embodiments of the invention. Typically, such attributes may be string type attributes wherein, for example, a particular user may be defined within the attribute. For example, a user profile may have an attribute called "role" for which the value may be set as "admin", which means that the user is an administrator of some type. Embodiments of the invention enable the owner of an application who understands his or her business and also understands the user's role, in turn, to translate that understanding into LDAP and provision it for a particular application.

FIG. **2** is a flow chart that illustrates an overview example of the process of onboarding and maintaining applications from an application owner's perspective for embodiments of the invention. FIG. **3** is a schematic diagram which illustrates an overview example of components and the flow of information between components for embodiments of the invention. Referring to FIGS. **2** and **3**, the process may follow a sequence executed on an internal application **300** of the enterprise. As a brief overview of the functionality of such an internal application **300**, within an enterprise, every service or product may be ordered through the internal application **300**. The internal application **300** may include, for example, various forms and involve workflows that allow users to order from the application in a manner somewhat similar to an e-commerce form. Thus, a user may order a service or product which is then submitted for approval and after approval, the product or service is delivered.

Referring to FIG. **2**, embodiments of the invention may involve a number of roles within the LDAP service of the enterprise. Such roles may include, for example, a requestor **200**, a systems inventory application owner **202**, an enterprise LDAP owner **204**, a single sign-on (SSO) owner **206**, and an enterprise LDAP group administrator **208**. Referring to FIG. **3**, it is noted that a systems inventory server **302** may store all application details for the enterprise. Thus, the systems inventory server **302** may be a repository of the enterprise with which all of its applications are registered.

Referring further to FIGS. **2** and **3**, assume, for example, that an application owner **202** wants to define rules for the application, referred to herein as app rules. In order to

accomplish this, the application owner **202** may log in as a requestor **200** to the internal application **300** for embodiments of the invention. Generally, the application manager **202** is in charge of an enterprise systems inventory application. The application manager **202**, as the requestor **200**, may recognize, for example, that he or she may not be available at a particular time and that it would not be good to interrupt a process of the application because of such unavailability. Thus, at **2081**, the app owner **202** may assign his or her delegates.

Once that is done, the requestor **200**, who may be the application owner **202** or someone else, may request a functional ID with the enterprise LDAP server **304**. Any system application user or other person who needs to connect to the enterprise LDAP **304** must prove or authenticate himself or herself to the LDAP **304** in order to obtain the connection. The user's functional ID may be used to make the LDAP server **304** aware of the user's entitlement to access. Applications may use a functional ID to connect to the LDAP server **304** in order, for example, to enter a modification or query.

Referring again to FIGS. **2** and **3**, at **2082**, the application owner as requestor **200** may create a functional ID for the application with the enterprise LDAP server **304**. Form fields for the create functional ID process at **2082** may include, for example, functional ID identifier, application support group mail alias, justification, additional comments, and a reason for the request. It is to be understood that instead of requiring the requestor **200** to provide an administrator a justification in the sense of proving a need, for example, to create the functional ID, it is only necessary for the requestor **200** to provide the reason for requesting the creation of the functional ID.

Approval of the functional ID creation may be performed by the enterprise LDAP owner **204** and the SSO team **206**, which is an operational team. It is to be further understood that the approval is automated, so that when a request is received, it is only necessary for the approver to review and approve the request. There is no need for the requestor **200** to negotiate, for example, with an administrator, because the process is a predetermined, automated process in which a request is simply reviewed. If everything appears to be in order, the request is approved. Thus, it is not necessary, for example, for someone to return to the LDAP server behind the scenes and run customized commands and the like.

Referring further to FIGS. **2** and **3**, after the functional ID is created, at **2083**, the requestor **200** may request, for example, the creation of a custom attribute, such as "app role". Accordingly, after the approval, an "app role" may be created as the attribute. Form fields for the process to the custom attribute may include, for example, application ID, attribute identifier, derived attribute name, attribute alias, attribute option, reason for the request, and additional comments. Once the attribute is created, at **2084**, functional ID access to the customer attribute may be granted or revoked. After creating the functional ID at **2082** and creating the custom attribute at **2083**, they may be bound together at **2084**. At **2084**, access may be granted to the functional ID on the attribute, and access may likewise be revoked. Thus, an application owner as requestor **200** has complete control over determining which functional IDs can update attributes, and if the application owner judges that someone should not have access, that person's access may be revoked. In the past, granting and revoking functional ID access to attributes required the application owner to call up, for example, the administrator or first level support personnel and channel such grant or revocation through one of those entities, which was extremely time consuming.

Referring once more to FIGS. **2** and **3**, as noted above, after the attribute is created at **2083**, it may be necessary to bind the attribute providing, in effect, that a functional ID for the application has complete access over the particular attribute, "app role" at **2084**. Thus, no other application may be allowed to update the particular attribute. For this purpose, form fields for the grant access to functional ID process may include blanks for entry, for example, of application ID, attribute, to whom the application ID functional ID belongs, functional ID, access type, whether the access (ACI) already exists, whether the LDAP service is required to have IP based restrictions for the particular functional ID, acknowledgements, source IP restriction, reason for the request, and additional comments. It is to be understood that granting functional ID access to the custom attribute at **2084** is complex on the backend because many things must be managed. For example, access control information (ACI's) must be designed. Such ACI's may consist of access control lists which tell the LDAP server **304** which functional IDs and other IDs have what type or types of access within the LDAP service. Thus, after approval, at **2084**, functional ID access may be granted for the particular application on the "app role" attribute.

Referring also to FIGS. **2** and **3**, at **2085**, the "app role" attribute may be defined as a LDAP group. This means, for example, that anyone who has "app role" equals "admin" would fall under an admin group, and anyone who has "app role" equals "user" would fall under a user group. Form fields for the create dynamic LDAP group may include, for example, application ID, attribute name, attribute value, dynamic group name, does this LDAP already exist in the enterprise LDAP server **304**, does the application own the chosen LDAP group name in the enterprise SSO LDAP server **306**, is an enterprise entitlement review system EERS feed **308** required and related fields, reason for the request, and additional comments. In addition, at **2086**, administrators may be added who will represent the application and may be allowed to add or remove people from the LDAP group or from the "app role". Form fields for the assigning group administrator process may include, for example, application ID, dynamic group name, administrator user ID, test if the user ID is already an administrator, reason for the request, and additional comments. It is to be understood that the approvals referred to in each of the foregoing processes is an acknowledgment rather that a granting of permission.

Referring again to FIG. **2**, additional processes for embodiments of the invention may include, for example, managing functional ID and IP address restriction **2088** by which source IP addresses from which a functional ID can connect may be restricted. Thus, an unauthorized person who acquires a functional ID and password cannot connect from a server other than via connections that have been pre-assigned and pre-approved. Form fields for the manage functional ID/IP address restriction may include, for example, attribute application ID, attribute, to whom does application ID functional ID belong, functional ID, access type, does the access (ACI) already exist, ACI, current IP address restriction, new IP address restriction, new ACI, acknowledgements, reason for the request, and additional comments. Another process may involve functional ID password reset **2089**, so that someone who needs to reset a password may accomplish this as well. At the same time, an enterprise paradigm may require a review of all accesses that everyone at the enterprise may have. Form fields for the functional ID password reset process may include, for example, application ID, functional ID, password, reason for the request, and additional comments. Using an EERS feed setting process **2090**, applications may also be allowed to opt in or out of a feeder process in which the type or types of access a particular person or user profile is fed to an (EERS) **308**. In an update functional ID contact mail address process **2091**, primarily for operational purposes, contacts may be set, for example, if system maintenance or a system upgrade is being performed about which a contact address may be needed.

It is to be noted that the foregoing processes are illustrated from a high level point of view of an app owner or application. It is not necessary, for example, for the application to know how the LDAP service is constructed or how it works behind the scenes. In embodiments of the invention, the world of the LDAP is translated into a business world wherein the process is defined in business terms instead of LDAP terms and provisioned into the enterprise LDAP server **304**.

Referring to FIG. **3** a component of the invention is the enterprise LDAP server **304** which may be characterized as a hub of the functionality for embodiments of the invention. Another component is the enterprise SSO LDAP server **306** which may be, for example, a repository of all the internal users, which may include employees as well as consultants and others who are not customers, such as consumers and business customers. The enterprise SSO LDAP server **306** stores user IDs, passwords and various profile details for such internal users. A function of the enterprise SSO LDAP server **306** is to enable single sign-on in which a user may access multiple applications using the same user ID and password. Thus, all enterprise applications point to a web access management (WAM) tool, which is in turn coupled to the enterprise SSO LDAP server **306**. The enterprise SSO LDAP server **306** may be characterized as a type of authentication system, although it is not intended to function as a full-fledged authorization system in which an application can connect directly into whatever resource it needs or wants. However, the enterprise SSO LDAP server **306** was designed and functions as an authentication system that stores user ID's and passwords for all the users in the enterprise that perform single sign-on. Embodiments of the invention involve a solution in which the enterprise LDAP server **304** provides the authorization information. The enterprise LDAP server **304** not only provides the authorization information but also manages the information on its own. Thus, it is not necessary for enterprise applications to ask any of the enterprise support teams, administrative teams, engineering teams or operations teams to do anything specific for them.

Referring further to FIG. **3**, other components for embodiments of the invention include, for example, EERS feed **308** and RITS feed **310** which initialize the enterprise LDAP server **304**. The EERS feed **308** and RITS feed **310** serve as sources populated from the human resources (HR) system within the enterprise LDAP server **304**. For example, the RITS feed **310** receives its files from the HR system and feeds all the user details into the enterprise LDAP server **304** for embodiments of the invention. A reason for having a lookup **312** into the enterprise SSO LDAP server **306** is to avoid a situation in which a group or role may have already been defined in the enterprise SSO LDAP server **306**. Apart from that issue, the system for embodiments of the invention is literally independent.

Referring still further to FIG. **3**, as previously mentioned, embodiments of the invention include within the enterprise an internal application **300** through which every service or product may be ordered. An application owner or application admin may login to the internal application **300**, which is a web-based application, and invoke all of the products previously discussed herein, including without limitation, the functionality for creating attributes and ACIs, associating attributes and functional ID's, and all the other steps in order to manage a dynamic LDAP group. The enterprise identity management (IDM) service **314** functions somewhat as a backend for the enterprise internal application **300**. Thus, the enterprise internal application asset **300** functions as a workflow engine, and the IDM service **314** functions as a provisioning engine. Once an approval is made, the process goes to the enterprise identity management (IDM) service **314** and in turn to the enterprise LDAP server **304** and performs the provisioning previously defined within the IDM system **314**, such as custom attributes, dynamic group definition ACI's, and entries in functional ID's.

Referring again to FIG. **3**, the CIMS web services **316** provides information, for example, to look up user profiles, ACIs, and dynamic groups which are defined to enable enterprise internal application lookups, because a significant number of lookups occur within the workflow. Embodiments of the invention ensure that when lookups are performed, the business logic remains intact and all that is being done is translating the lookups into LDAP requirements. Thus, a considerable portion of the functions for embodiments of the invention goes into the CIMS search service **316** and also the IDM service **314** where much of the translation occurs. That also forms a part of the backend for embodiments of the invention, because it enables applications to be independent. Other components, such as the enterprise systems inventory **302**, where details of all enterprise applications are stored, are provided primarily for looking up application details. In embodiments of the invention, an application manager delegates to an application owner within the enterprise LDAP server **304**, so a preliminary action is using an enterprise systems inventory to perform a look-up **318** and to identify the application manager, because that is the only person who is entitled to approve system requests. Once the application manager assigns a delegate, the system for embodiments of the invention becomes practically self-sustaining. Further, that is done only once in the lifecycle of the application at the initiation of a project.

Again referring to FIGS. **2** and **3**, as previously noted, the requestor **200** may be the application owner **202** or any enterprise employee other than the application owner. The application owner **202** is identified by using the enterprise inventory system look-up **318**. While any enterprise employee may be a requestor **200**, the application owner **202** must approve any action requested. In embodiments of the invention, the application owner **202** is the person or role who would typically log in to the enterprise internal application **300**. However, any of the roles defined in FIG. **2**, such as the requestor **200** or the approver roles may log in to the enterprise internal application **300**. At **2081**, the application owner **202** is looked up on the enterprise systems inventory **302** prior to approval. At the same time, the enterprise internal application **300** has the relevant forms, and after an approval, the process proceeds to the enterprise IDM server **314**, which creates the delegates. At **2082**, wherein functional ID's are created, a similar model is followed. Thus, a user logs into the enterprise internal application **300** and fills in a form, after which the process proceeds to the enterprise IDM server **314** and is provisioned into the enterprise LDAP server **304**, and the process is iterated several times from **2081** through **2086**.

Additional processes which do not follow a particular sequence include, for example, manage functional ID IP address restriction **2088**, functional ID password reset **2089**, manage EERS feed setting **2090**, and update functional ID contact mail address **2091**. While not performed in any particular order, the process of each of those functions follows a similar model.

In embodiments of the invention, the components involved in any invocation of the process include, for example, the enterprise internal application **300**, the enterprise IDM server **314**, and the enterprise LDAP server **304** using the CIMS search service **316** and the CSI service **302**. In each case, a user may be provided with a form which helps the user, for example, with looking up values, details of applications, details of attributes, functional ID's, and LDAP groups.

In the past, the onboarding process required negotiations with and approval by an administrator in which the application owner or representative of the application owner called up the SSO team or the LDAP team and asked to create an attribute. In response, the owner or representative was asked to provide a justification for the requested attribute. In addition, the owner or representative was asked to describe the kind of attributes being requested and the number of such attributes. Again, the owner or representative was required to justify a need for the number of attributes. Thereafter, it was necessary to log on the LDAP server and run several commands, for example, to first create an attribute in the schema and then to create ACIs. It is self-apparent that such process was a burdensome administrative task which required the administrator to take time to create files in which the ACI's were defined to restrict access to a functional ID and attribute. Even after all that was done, testing on development was required, in which development staging for a cycle was required to be followed. The process was entirely manual and without standards and required an inordinate amount of time.

FIG. **4** is a flow chart that illustrates an example of the process of onboarding an enterprise LDAP server according to embodiments of the invention which overcome those problems and allow operational personnel to approve requests without lengthy negotiations with administrators. Referring to FIG. **4**, at **S1**, using a processor coupled to memory, a request related to at least one application is received from a requestor in pre-determined business logic. At **S2**, also using the processor, the request is acknowledged by an approver function without requiring the requestor to negotiate, for example, with an LDAP administrator to justify the request. As S3, the request is provisioned into the enterprise LDAP server in the pre-determined business logic, likewise using the processor.

Another feature of embodiments of the invention is standardization of all the processes involved, for example, by naming conventions. With embodiments of the invention, when a need arises for a role to be created, it can be done immediately. The only possible delay is for approvals which are required to maintain checks and balances, but the business and the infrastructure teams know what is being requested. The requests are immediately approved, and everything else occurs behind the scenes. The approvals are manual only in a sense that once a request is placed, it goes into the queues of the approvers. When a request goes into the queue of an approver, the approver simply makes the approval, and thereafter, the process is entirely automated. The approval is actually a notification to the approver and acknowledgement by the approver to assure that all of the approvers know that an action has been taken.

It is to be understood that embodiments of the invention may be implemented as processes of a computer program product, each process of which is operable on one or more processors either alone on a single physical platform, such as a personal computer, or across a plurality of platforms, such as a system or network, including networks such as the Internet, an intranet, a WAN, a LAN, a cellular network, or any other suitable network. Embodiments of the invention may employ client devices that may each comprise a computer-readable medium, including but not limited to, random access memory (RAM) coupled to a processor. The processor may execute computer-executable program instructions stored in memory. Such processors may include, but are not limited to, a microprocessor, an application specific integrated circuit (ASIC), and or state machines. Such processors may comprise, or may be in communication with, media, such as computer-readable media, which stores instructions that, when executed by the processor, cause the processor to perform one or more of the steps described herein.

It is also to be understood that such computer-readable media may include, but are not limited to, electronic, optical, magnetic, RFID, or other storage or transmission device capable of providing a processor with computer-readable instructions. Other examples of suitable media include, but are not limited to, CD-ROM, DVD, magnetic disk, memory chip, ROM, RAM, ASIC, a configured processor, optical media, magnetic media, or any other suitable medium from which a computer processor can read instructions. Embodiments of the invention may employ other forms of such computer-readable media to transmit or carry instructions to a computer, including a router, private or public network, or other transmission device or channel, either or both wired and wireless. Such instructions may comprise code from any suitable computer programming language including, without limitation, C, C++, C#, Visual Basic, Java, Python, Perl, and JavaScript.

It is to be further understood that client devices that may be employed by embodiments of the invention may also comprise a number of external or internal devices, such as a mouse, a CD-ROM, DVD, keyboard, display, or other input or output devices. In general such client devices may be any suitable type of processor-based platform that is connected to a network and that interacts with one or more application programs and may operate on any suitable operating system. Server devices may also be coupled to the network and, similarly to client services, such server devices may comprise a processor coupled to a computer-readable medium, such as a random access memory (RAM). Such server devices, which may be a single computer system, may also be implemented as a network of computer processors. Examples of such server devices are servers, mainframe computers, networked computers, a processor-based device, and similar types of systems and devices.

What is claimed is:

1. A method of onboarding an enterprise Lightweight Director Access Protocol (LDAP) server, comprising:

creating, by a processor coupled to memory, without involvement of an administrator, a functional identifier (ID) with the enterprise LDAP server responsive to a request and a reason for the request for the functional identifier (ID) from a non-administrator end user who is an application owner of at least one enterprise application responsible for objectives of the at least one enterprise application, wherein the request and a reason for the request for the functional identifier (ID) is received in pre-determined business logic;

creating, by the processor, without involvement of the administrator, the application owner's own application role custom attribute for authorization allowing the application owner functional identifier (ID) access for at least modification or query of the at least one enterprise application on the application owner's own custom attribute responsive to a request and a reason for the request for the application role custom attribute from the non-administrator end user, wherein the request and a reason for the request for the application role custom attribute is received in pre-determined business logic;

generating, using the processor, a notification and acknowledgement of the respective requests by an approver function without involvement of the administrator; and

provisioning, using the processor, the application owner's application role custom attribute for authorization allowing the application owner functional identifier (ID) access for at least modification or query of the at least one enterprise application on the application owner's own custom attribute into the enterprise LDAP server based solely on the reason for the request and without involvement of the administrator.

2. The method of claim **1**, further comprising receiving the request to create the application owner's own application role custom attribute for authorization consisting at least in part of a request to provision the custom attribute defining the non-administrator end user within the attribute.

3. The method of claim **2**, further comprising receiving the request to create the application owner's own application role custom attribute defining the user consisting at least in part of a request to provision a string type custom attribute defining the non-administrator end user within the attribute.

4. The method of claim **1**, further comprising receiving the request to create the application owner's own application role custom attribute in pre-determined business logic consisting at least in part of translating the request into LDAP logic.

5. The method of claim **1**, further comprising receiving the request to create the application owner's own application role custom attribute on form fields displayed by a web-based internal application of an enterprise.

6. The method of claim **1**, further comprising receiving a request for at least one of granting or revoking functional ID access to the custom attribute, creating or deleting a dynamic LDAP group, assigning a dynamic group administrator, and adding or removing a member from a dynamic LDAP group.

7. The method of claim **1**, further comprising receiving a request for at least one of managing functional identifier (ID) Internet Protocol (IP) address restriction, functional ID password reset, manage enterprise entitlement review system (EERS) feed, and update functional ID contact mail address.

8. The method of claim **1**, wherein generating the notification and acknowledgement of the respective requests further comprises generating the notification and acknowledgement of the respective requests by at least one of an enterprise LDAP owner and a single sign-on (SSO) owner.

9. The method of claim **8**, wherein generating the notification and acknowledgement of the respective requests further comprises reviewing the request and acknowledging the request in a pre-determined automated sequence.

10. The method of claim **9**, wherein acknowledging the request in the pre-determined automated sequence further comprises approving the request without requiring justification of a need for the request.

11. The method of claim **10**, wherein approving the request further comprises sending the request to a queue for the approver function.

12. The method of claim **1**, wherein provisioning the request further comprises granting the functional identifier (ID) access for the at least one application on the non-administrator end user's own custom attribute.

13. The method of claim **1**, further comprising performing lookups using a LDAP logic translation of pre-determined business logic.

14. A system for onboarding enterprise Lightweight Directory Access Protocol (LDAP) server, comprising:

a processor coupled to memory, wherein the processor is programmed to:

create without involvement of an administrator, a functional identifier (ID) with the enterprise LDAP server responsive to a. request and a reason for the request for the functional identifier (ID) from a non-administrator end user who is an application owner of at least one enterprise application responsible for objectives of the at least one enterprise application, wherein the request and a reason for the request for the functional identifier (II) is received in pre-determined business logic;

create, without involvement of the administrator, the application owner's own application role custom attribute for authorization allowing the application owner functional identifier (ID) access for at least modification or query of the at least one enterprise application on the application owner's own custom attribute responsive to a request and a reason for the request for the application role custom attribute from the non-administrator end user, wherein the request and a reason for the request for the application role custom attribute is received in pre-determined business logic;

generate, a notification and acknowledgement of the respective requests by an approver function without involvement of the administrator; and

provision the application owner's application role custom attribute for authorization allowing the application owner functional identifier (ID) access for at least modification or query of the at least one enterprise application on the application owner's own custom attribute into the enterprise LDAP server, based solely on the reason for the request and without involvement of the administrator.

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